

ON LIPAROCEPHALUS AND ALLIED GENERA  
(COLEOPTERA; STAPHYLINIDÆ)BY J. C. CHAMBERLIN AND G. F. FERRIS<sup>1</sup>

The subfamily Aleocharinæ of the family Staphylinidæ contains among its horde of species a few forms that occur along the ocean shore and that have adapted themselves to at least a partially aquatic existence. Certain of these species, totaling, according to the Fenyès catalogue in *Genera Insectorum*; five genera and nine named forms, are placed by that author together in a little group that he calls the Liparocephali, under the tribe Bolitocharini. Three of the included genera are recorded only from the northern Pacific coast of North America.

Until very recently nothing has been known concerning the immature stages of any of the American forms, although the larva of *Antarctophytosus atriceps* (Waterhouse), from the Crozet Islands in the Antarctic region, has been described in some detail by Enderlein.<sup>2</sup> It is worthy of note that as late as 1913 Fenyès<sup>3</sup> has listed but thirty-nine of the five thousand or so named species of the Aleocharinæ as at all known in their immature stages. Since that time a few more have been described, but our knowledge is still extremely slight. It is therefore obvious that no opportunity to add to the sum total of our information concerning these stages should be neglected. It was from the intention to describe the larva of a species of *Liparocephalus* that the present paper has had its origin.

Saunders<sup>4</sup> has recently recorded the finding of the larvæ of two species of this group on the coast of British Columbia and has presented some information concerning them. The present writers in the course of visits to the reef at Moss Beach, just south of San Francisco, California, have taken the adults of four species, the pupæ of two and the larvæ of three, thus making possible a considerable extension of our knowledge.

<sup>1</sup> The arrangement of the authors' names is alphabetical and indicates neither seniority nor precedence.

<sup>2</sup> Enderlein, G. *Deutsche Südpolar Expedition, Zoologie, Band 2:377* (1908).

<sup>3</sup> Fenyès, A. *Genera Insectorum, Fasc., 173A:6* (1918). (Records cease at 1913.)

<sup>4</sup> Saunders, L. C. *Ann. Ent. Soc. Am., 21:542; fig. 9* (1928).

Our interest while primarily in the larvæ has of necessity led to some study of the adults as well, and we have consequently familiarized ourselves with the literature concerning them. It is evident from this literature that the systematic work on such small forms as the Aleocharinæ has in the past been greatly hampered by the methods that have quite generally been employed and by the attitude of mind in which their study has been approached. The views of Casey,<sup>5</sup> as voiced in connection with the paper in which certain of the species here to be considered were described, to the effect that "facies, however, here as elsewhere, frequently goes far as a guide and is much more important than any single organic structural peculiarity" seem still to be reflected in a general obscurantism as to structural characteristics, an obscurantism that is by no means limited to that particular author. His further remark, "It is unfortunate, having in view the optical means of investigation usually employed, that the Aleocharini are so small in size" indicates the deficiency in method and no special attempts to remedy that defect by the employment of improved methods seem generally to have been made. Deficiency of viewpoint and deficiency in method together have thus resulted in a condition such that the student aspiring to some precise morphological knowledge which may be used as a basis for taxonomic judgments can find but little nourishment in the existing literature.

We have consequently extended our studies from a consideration merely of the immature stages to include a treatment of the adults as well. As a basis for this treatment we have utilized material that has been cleared, dissected and mounted upon slides, discarding entirely any attempt to work from the conventional pinned specimens. By these methods the difficulties that have been supposed to inhere in the small size of these and similar forms disappear completely or become converted even into positive advantages. The extension of such methods to the study of the small Coleoptera in general, not to mention the larger forms, seems indicated as a desirable, if not even imperative, procedure.

We are indebted to Professor E. C. Van Dyke of the University of California for assistance in the determination of a portion of our material.

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<sup>5</sup> Casey, T. *Annals New York Academy Sciences*, 7:283 (1894).

## THE GROUP LIPAROCEPHALI

This group, as formulated by Fenyés, includes the five genera *Liparocephalus* Mäklin, *Diaulota* Casey, *Amblopusa* Casey, *Actocharis* Fauvel and *Antarctophytosus* Enderlein. The first four genera are apterous, except for the elytra, but the last named has the posterior wings "strongly reduced." Specimens representing the first three alone are available for examination. We shall on the basis of these three present a brief discussion of some of the morphological features that are of interest.

The mandibles of certain of these species tend to be asymmetrical, the left mandible having the median tooth more or less reduced and smaller than that on the right (see Fig. 2). In the species of *Liparocephalus*, however, this does not appear to hold and the mandibles are symmetrical. In any case the character seems to be specifically rather variable.

We would here call attention to a structure that appears to have been much neglected in the literature. On the inner face of the mandible and arising from near the base is a narrow, membranous lobe (Fig. 1I,K) which bears a comb of as many as a hundred or more delicate, laminate teeth. This structure is the *prostheca*. While it occurs probably throughout the Staphylinids and is known in other groups as well it seems never to have been extensively investigated. Rather vague references and indications in figures seem to indicate that it may vary in form and if so it would doubtless offer taxonomic possibilities.

There is present also on the mandible at about the middle of the lateral margin a curious pore with an underlying canal (Fig. 1J). An investigation of the occurrence of this pore might be of interest. It is possibly a sensory structure of some sort. It is present in the larvæ also.

The labial palpi are normally two-segmented with the basal segment showing a pseudo-articulation, and they are so described in the literature. However, in one species, *Diaulota brevipes* (Casey), the palpi are variable and every condition from the normal to that of definitely three segments is to be found (Fig. 2Q,R). The ligula in all the species is small, sclerotic and cuneiform in shape. The hypopharyngeal face of the labium shows two comb-like rows of setæ, while in some

other Staphylinids this same area is produced into a pair of lobe-like processes bearing brushes of setæ.

The eyes are small in all the species. In the genus *Diaulota* setæ are interspersed with the facets, while in *Liparocephalus* the eyes are hairless (Fig. 2E, F).

The genal region is defined by a distinct, raised line on the ventral side of the head. In *Diaulota brevipes* this line is variable and may either be well developed or almost completely lacking.

The prothorax presents no features of special interest, although we would call attention to the fact that the cervical sclerites are much less complex in these forms than in some of the other Staphylinids.

The pterothorax is greatly reduced, possibly in correlation with the absence of the posterior wings (Fig. 1D). The meso- and metanota are so completely fused that the separate parts can scarcely be distinguished and the reduction and fusion of the sternites has been carried almost as far. The pleurites remain as small, distinct pieces. The metathoracic spiracle is in all cases extremely small, so small as to be difficult to detect even in favorable preparations, and in *Liparocephalus brevipennis* at least it is probably functionless.

The abdomen presents seven normally visible tergites and six sternites. We interpret these as being the tergites of the first to seventh and the sternites of the second to seventh segments, an interpretation which does not agree at all with that given by Fenyès for the Staphylinidæ in general, that author recognizing ten tergites and assigning the first apparent sternite to the third segment. We believe our interpretation to be in accord with that of Tanner.<sup>6</sup> The eighth and succeeding segments are retracted normally within the abdomen.

The tergites and sternites in all cases bear at their anterior border an impressed, glabrous area that is bounded posteriorly by a distinct, raised line. This area fits normally beneath the free epiphysis of the preceding segment, but if the abdomen be expanded it will be more or less exposed. Nevertheless the quite illusory distinction of "tergites 3-7 equally impressed at base" and "tergites 3-5 transversely impressed at base" has been

<sup>6</sup> Tanner, V. M. Trans. Am. Ent. Soc., 53:17 (1927).



utilized in literature. It may be noted that this area on the sixth tergite is produced conspicuously forward.

Spiracles are present on segments one to seven. They are extremely small and are located at the lateral margins of the tergites. The spiracles of the first segment are not at all enlarged as is the case in many beetles and, as claimed by Fenyés, in the Staphylinidæ in general. They present no peculiarities of structure.

We would especially call attention to the presence of distinct pleural plates on the second to sixth abdominal segments. These plates constitute the "lateral border" or "lateral furrow" of authors and their identity as pleurites is not at all indicated in the literature dealing with this particular group. In the genera under consideration and evidently in many other Staphylinidæ these plates are divided longitudinally into two pieces. In at least some Staphylinids they are plainly undivided.

In many of the Staphylinidæ the intersegmental membranes of the abdomen are beautifully marked by a mosaic of minute plates that are variously arranged. In the present group this mosaic is lacking.

In the female the genitalia are almost entirely membranous and we have been unable to make anything out of them. In the male the œdeagus and claspers assume a form that is quite well defined for the group (Fig. 4*A, B, C, D*). The sexual differences in the form of the abdomen are but slight, the male having the seventh sternite produced posteriorly into a rounded point, which is lacking or but weakly developed in the female, and having also the lateral lobes of the eighth sternite longer and somewhat asymmetrical in their basal attachments. In addition there is present in the male a small ventral piece, somewhat asymmetrical in form, which represents perhaps the sternite of the ninth segment.

The spermatheca in the female is quite small and consists of a more or less elongate and thin-walled tube that terminates in a swollen bulb with thick and heavily sclerotic walls. In the female of *L. brevipennis* (Fig. 1*F*) this bulb is very thick-walled and the tube is rather short and broad, while in the females of *Diaulota insolita* and *D. brevipes* the tube is much longer and more slender and the bulb much thinner walled.

The segmentation of the tarsi has been employed as a primary character in the division of the Aleocharinæ into tribes, the tribe Bolitocharini, to which the Liparocephali belong, being defined as having the tarsal segmentation in a 4-4-5 formula. This holds in three of the species at hand, but in one, *Diaulota brevipes*, the segmentation of the posterior tarsi is variable. We have at least one specimen of this species showing clearly five-segmented fourth tarsi; others, and these are in the majority, are clearly but four-segmented. Gradations between these two extremes are likewise at hand. The proportions of the segments and the arrangement of the setæ (Fig. 3E) indicate that the four-segmented condition arises from a fusion of the normal fourth and fifth segments.

On the basis of the usual classification these varying forms would go even into separate tribes. One cannot but be led to reflect upon the possible conditions to be found in the taxonomy of a group where a single and demonstrably unreliable character has been depended upon almost exclusively for general groupings.

In all the species at hand the body is more or less thickly and uniformly beset with very small setæ. There is no such armament of combs of modified setæ as is to be seen in properly prepared specimens of many other Staphylinids. The derm in all the species is quite uniformly unornamented.

#### THE AMERICAN GENERA

Of the five genera referred by Fenyès to this group, representatives of three, *Liparocephalus*, *Diaulota* and *Amblopusa* are available. To these three genera there have been referred seven supposed species, of which four are at hand. On the basis of the available material we believe the genera *Diaulota* and *Liparocephalus* to represent valid and distinct groups. *Amblopusa*, however, we hold to have been based upon illusory characters and to be a synonym of *Diaulota*. The two American genera thus left may be distinguished by the following characters:

Eyes hairy; mandibles asymmetrically developed and without serrations between apex and median tooth; mesal portion of the abdominal pleurites plainly broader and larger than the lateral portion; plantar setæ of the tarsi simple, non-spatulate; anterior margin of the labrum strongly rounded; terminal antennal segments plainly

broader than long; dorsal comb of apical setæ on the third tibia clearly differentiated and separated from the two ventral spurs.....

.....*Diaulota* Casey

Eyes not hairy; mandibles symmetrically developed and with a series of distinct serrations between the apex and the median tooth; mesal portion of the abdominal pleurites plainly narrower and smaller than the lateral portion; plantar setæ of the tarsi, at least in part, of a conspicuously spatulate form; anterior margin of the labrum truncate; terminal antennal segments clearly longer than broad; dorsal comb of apical setæ on the third tibia not clearly separated from nor differentiated from the ventral spurs.....

.....*Liparocephalus* Mäklin

### Genus LIPAROCEPHALUS Mäklin <sup>7</sup>

We are able to recognize in our material two clearly distinct species of this genus, one unfortunately represented by but a single specimen.<sup>8</sup> We are inclined to identify these with the two named species now referred to the genus. They may be separated by the following characters:

Head conspicuously broader than the prothorax and distinctly broader than long (length taken from the clypeal suture to the extreme posterior border of the head), the proportions being as 7-6; head lighter in color than the rest of the body; length (on slide and somewhat expanded) 6 mm.....*cordicollis* Leconte

Head and thorax practically equal in width, length of head equal to width or but very slightly greater; of a uniformly dark color; length (on slide and somewhat expanded) 4.5-5 mm.....

.....*brevipennis* Mäklin

In addition to the characters indicated in the above key we would call attention to evident differences in the genitalia of the males (Fig. 4A, C), which are difficult to express in words.

#### LIPAROCEPHALUS BREVIPENNIS Mäklin

1928. *Liparocephalus brevipennis* Mäklin, Saunders, Ann. Ent. Soc. Am., 21:542; fig. 9A, B, C.

*Material examined.* Many males and females, two or three pupæ and several larvæ from Moss Beach, San Mateo County, California, November, 1926, and January 11, 1928, collected by J. C. Chamberlin and G. F. Ferris.

<sup>7</sup> The Leng Catalogue of the Coleoptera being readily available to students, references will be given only to papers not appearing therein.

<sup>8</sup> Our interpretation of these species is not in accord with the views of Van Dyke. The species which he has identified for us as *L. brevipennis* var. *cordicollis* we hold, on the basis of Leconte's descriptions and key, to be *brevipennis*, while we identify a single male that we possess (not seen by Van Dyke) as being *cordicollis* Leconte. If it be not that species it is undescribed.

(To be Continued)